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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,163	03/30/2001	Konstantine I. Iourcha	PA1744US	8104

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EXAMINER	
MCCARTNEY, LINZY T	

ART UNIT	PAPER NUMBER
2671	8

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/823,163	IOURCHA ET AL.	
	Examiner	Art Unit	
	Linzy McCartney	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 25 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,480,205 to Greene et al. (Greene).

a. Referring to claim 25, Greene discloses upon receiving a primitive object, dividing the primitive object into areas delimited by splits, wherein the splits are defined by analytic functions (column 16, lines 32-59; column 14, lines 10-19); representing depth information for at lest one of the areas by analytic function (column 17, lines 34-40); and performing a visibility test based on depth information for the areas (column 17, lines 34-45).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 8-11, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,923,332 to Izawa in view of Greene.

a. Referring to claim 1, Izawa discloses representing depth information by a piecewise function (column 6, lines 27-51) and updating the piecewise function based on the results of the visibility test (column 7, lines 12-28). Greene discloses upon receiving a primitive object, dividing the primitive object according to areas defined by at least one analytic function (column 16, lines 32-59; column 14, lines 10-19); performing a visibility test based on depth information for the areas (column 17, lines 34-45). At the time the invention was made it would have been obvious to a person of ordinary skill in the art to modify the disclosure of Izawa by diving a primitive object and performing a visibility test as taught by Greene. The suggestion/motivation for doing so would have because it would reduce the amount of geometric and image information that must be processed, thereby reducing memory and bus traffic and improving performance (Greene, column 4, lines 60-64).

b. Referring to claim 2, Izawa discloses wherein each piece of piecewise function is an analytical function of a predefined class defined by corresponding parameters (column 6, lines 23-27; Fig. 8).

c. Referring to claim 3, Izawa does not explicitly disclose wherein the analytical function is a linear function (column 6, lines 33-41).

d. Referring to claim 4, Izawa discloses wherein analytical function is a non-linear function (Fig. 8).

d. Apparatus claims 8-11 recites steps performed by the method claims 1-4; therefore they are similar in scope and are rejected under the same rationale.

e. Program claim 23 recites steps performed by method claim 1; therefore they are similar in scope and are rejected under the same rationale.

f. Apparatus claim 24 recites steps performed by method claim 1; therefore they are similar in scope and are rejected under the same rationale.

2. Claims 5-7 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izawa in view of Greene as applied above further in view of U.S. Patent No. 5,509,110 to Latham.

a. Referring to claim 5, the modified method of Izawa does not explicitly disclose wherein the dynamic search structure is a tree-based structure. Latham discloses wherein a dynamic search structure is used for fast access to the areas of a split overlapping with the primitive object (column 6, lines 30-39). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to further modify the disclosure of Izawa by including a dynamic search structure as taught by Latham. The suggestion/motivation for doing so would have been because it would generate high quality computer graphics imagery and minimize the computations required for occlusion processing (Latham, column 2, lines 41-47).

b. Referring to claim 6, the modified method of Izawa does not explicitly disclose wherein the dynamic search structure is a tree-based structure. Latham discloses wherein the dynamic search structure is a tree-based structure (column 6, lines 34-35). At the time the invention was made, it would have been obvious to a person of ordinary skill in the

art to further modify the disclosure of Izawa by using a tree-based structure as taught by Latham. The suggestion/motivation for doing so would have been because it would generate high quality computer graphics imagery and minimize the computations required for occlusion processing (Latham, column 2, lines 41-47).

c. Referring to claim 7, Izawa discloses wherein each piece of the piecewise function is defined on a segment of a scanline (column 3, lines 24-39; column 6, lines 23-26).

d. Apparatus claims 12-14 recites steps performed by the method claims 5-7; therefore they are similar in scope and are rejected under the same rationale.

3. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Latham in view of Izawa.

a. Referring to claim 15, Latham discloses a span generator for generating spans for each of the primitive objects, a span corresponding to each horizontal scan line occupied by the primitive object, the span characterized by positional data and depth data (column 3, line 46 – column 4, line 10; column 11, line 51 – column 12, line 4); and a visible surface determination module responsive to the depth data associated with each of the spans for determining visible segments of each of the spans and for generating position data corresponding to each of the visible segments of each of the spans (column 12, lines 5-11). Latham does not explicitly disclose comparing depth information with depth information defined by an area represented by a piecewise function. Izawa discloses comparing depth information with depth information defined by an area represented by a piecewise function (Abstract; column 7, lines 12-28). At the time of the invention, it

would have been obvious to one of ordinary skill in the art to modify the disclosure of Latham by comparing depth information for each span with depth information defined by area represented by a piecewise function as taught by Izawa. The suggestion/motivation for doing so would have been it would make a coarse distribution of Z values in the entire depth range without increasing the number of bits for representing the Z values (Izawa, column 4, lines 48-50) and because it would allow accurate and high-speed comparison of Z-values to be conducted without increasing the volume of the Z-buffer memory (Izawa, column 4, lines 53-55).

b. Referring to claim 16, Latham discloses means for storing the position data corresponding to each of the visible segments of each of the spans for causing storage depth data corresponding to each of the visible segments of each of the spans (column 6, lines 11-17; column 11, lines 46-50; Fig. 3).

4. Claims 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greene in view of Latham further in view of Izawa.

a. Referring to claim 17, Greene discloses a processing device (Fig. 1); a display device coupled to the processing device for displaying the 3D image (Fig. 1; column 7, lines 30-32); a graphics engine coupled to the processing device for performing visible surface determination (Fig. 1; column 7, lines 25-32); and a storage device for storing results of the visible surface determination (Fig. 1; column 7, lines 33-39), wherein regions of the primitive objects and the associated depth information are defined by analytical functions (column 17, lines 34-45). Greene does not explicitly disclose comparing depth information for a span with depth information defined by an area

represented by a piecewise function. Latham discloses comparing depth information for a span (column 5, lines 15-31; Fig. 1). Izawa discloses comparing depth information with depth information defined by an area represented by a piecewise function (Abstract; column 7, lines 12-28). (Abstract; column 7, lines 12-28). At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the disclosure of Greene by comparing depth information for a span with depth information defined by an area represented by a piecewise function as taught by Latham and Izawa. The suggestion/motivation for doing so would have been because utilizing spans would facilitate generating high quality computer graphics imagery and minimizing the computations required for occlusion processing (Latham, column 2, lines 41-47) and comparing depth information with depth information defined by an area represented by a piecewise function would facilitate making a coarse distribution of Z values in the entire depth range without increasing the number of bits for representing the Z values (Izawa, column 4, lines 48-50) and it would allow accurate and high-speed comparison of Z-values to be conducted without increasing the volume of the Z-buffer memory (Izawa, column 4, lines 53-55).

b. Referring to claim 18, Greene does not explicitly disclose a span generator for generating spans corresponding to each horizontal scanline of the primitive object. Latham discloses a span generator for generating spans corresponding to each horizontal scanline of the primitive object (column 3, line 46 – column 4, line 10; column 11, line 51 – column 12, line 4). At the time invention was made, it would have been obvious to a person of ordinary skill in the art to modify the disclosure of Greene by including a span

generator as taught by Latham. The suggestion/motivation for doing so would have been because it would facilitate generating high quality computer graphics imagery and minimizing the computations required for occlusion processing (Latham, column 2, lines 41-47).

c. Referring to claim 19, Greene discloses a visible surface determination module (Fig. 1; column 7, lines 27-39). Greene does not explicitly disclose a span generator coupled to the visible surface determination module. Latham discloses a span generator (column 3, line 46 – column 4, line 10; column 11, line 51 – column 12, line 4). At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the disclosure of Greene by coupling a span generator to the visible surface determination module as taught by Latham. The suggestion/motivation for doing so would have been because it would facilitate generating high quality computer graphics imagery and minimizing the computations required for occlusion processing (Latham, column 2, lines 41-47).

d. Referring to claim 20, Greene discloses storing the results in a linked list format (column 33, lines 15-31).

e. Referring to claim 21, Greene does not explicitly disclose storing the results in a binary tree format. Latham discloses storing the results in a binary tree format (column 6, lines 30-39). At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the disclosure of Greene by storing the results in a binary tree as taught by Latham. The suggestion/motivation for doing so would have been because it would facilitate generating high quality computer graphics imagery and

minimizing the computations required for occlusion processing (Latham, column 2, lines 41-47).

f. Referring to claim 22, Greene discloses wherein the results comprise information indicative of relative depth of a first visible segment in relations to a second visible segment (column 17, lines 42-45).

Response to Arguments

5. Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Linzy McCartney** whose telephone number is **(703) 605-0745**. The examiner can normally be reached on Mon-Friday (8:00AM-5: 30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Mark Zimmerman**, can be reached at **(703) 305-9798**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

ltm
25 September 2003

MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600